

RAC Service Tool Kit Instruction Manual – Version 1.1

PURPOSE:

This service tool kit has been developed to improve accuracy when testing and diagnosing components incorporated in Mitsubishi Heavy Industries “S” series Air-Conditioners.

- Test and operate DC fan motors with manual variable speed control
- Test PCB voltage output to DC fan motors with manual variable speed control
- Test output from transistors to inverter compressor
- Monitor operational data and error codes
- Recover operational data log from SD memory card or PC

Tools Part	DMCT	CCCT	COMT	INVERTER CHECKER
DC Motor	☑			
PWB 1 (Main)		☑	☑	
PWB 2 (Power)				☑
PWB 3 (Capacitor)			☑	
Compressor			☑	
Thermistor's			☑	

Service Tool	Function
DC Motor Checker (DMCT)	<ul style="list-style-type: none"> ○ Operate the DC Motor external of PCB ○ Noise Test of DC motor at various rpms
Control Circuit Checker (CCCT)	<ul style="list-style-type: none"> ○ Confirm PCB voltage output to DC Motor ○ Confirm response from DC Motor to PCB
Inverter Checker (ICT)	<ul style="list-style-type: none"> ○ Visually view output from PCB/ Transistor to compressor
Communication Checker (COMT)	<ul style="list-style-type: none"> ○ View Error display ○ Check operation data (Temperatures, Current, Hz etc)



1. Connect the wiring correctly as detailed in the instructions, incorrect termination or configuration could result in electric shock or fire.
2. be sure to fasten the wiring firmly, never connect data wiring (No 3) to high voltage
3. Confirm that voltage has been discharged before touching wiring (Less than 10VDC) as capacitors store voltage.
4. Only licensed and qualified staff should operate these service tools
5. be sure to turn off the power prior to installation

Note

- Mitsubishi Heavy Industries do not accept any responsibilities for any technical trouble that may occur during the use of these tools
- Mitsubishi Heavy Industries reserves the right to change specifications without any advanced notice

SPECIFICATION:

- Power source: 1 phase 220/240V 50Hz
- Operation Temperature: 0 to 43°C
- Relative Humidity: Max 85% RH
- Weight: 6.5kg (Inc Tools)

CONTENT:

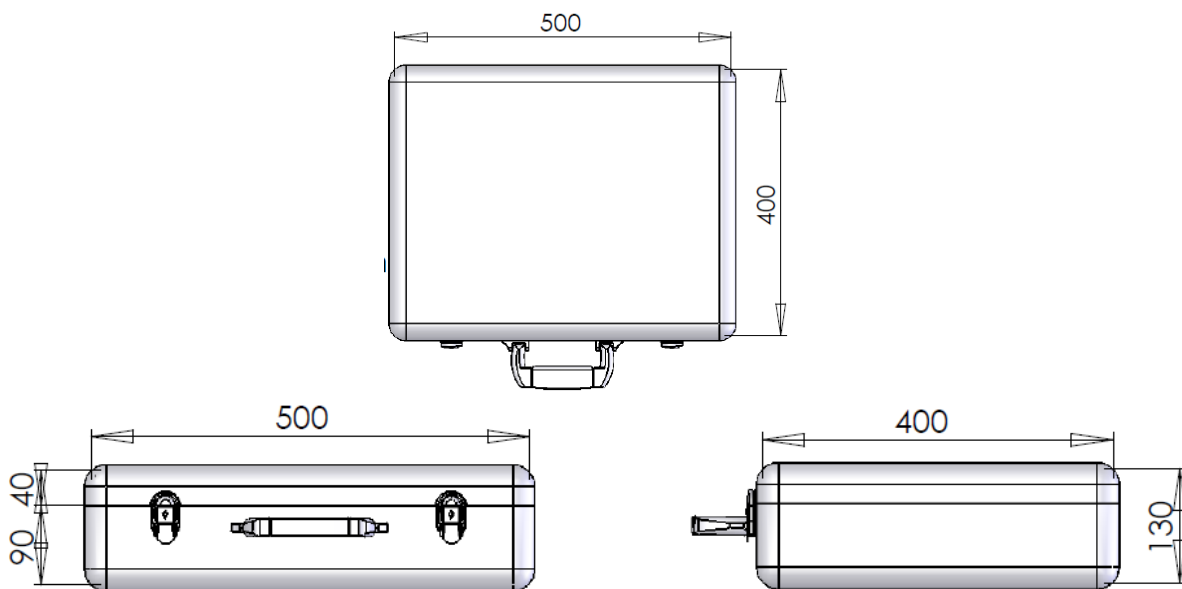
Part No: RMA006A001

Description: SERVICE TOOL ASSY

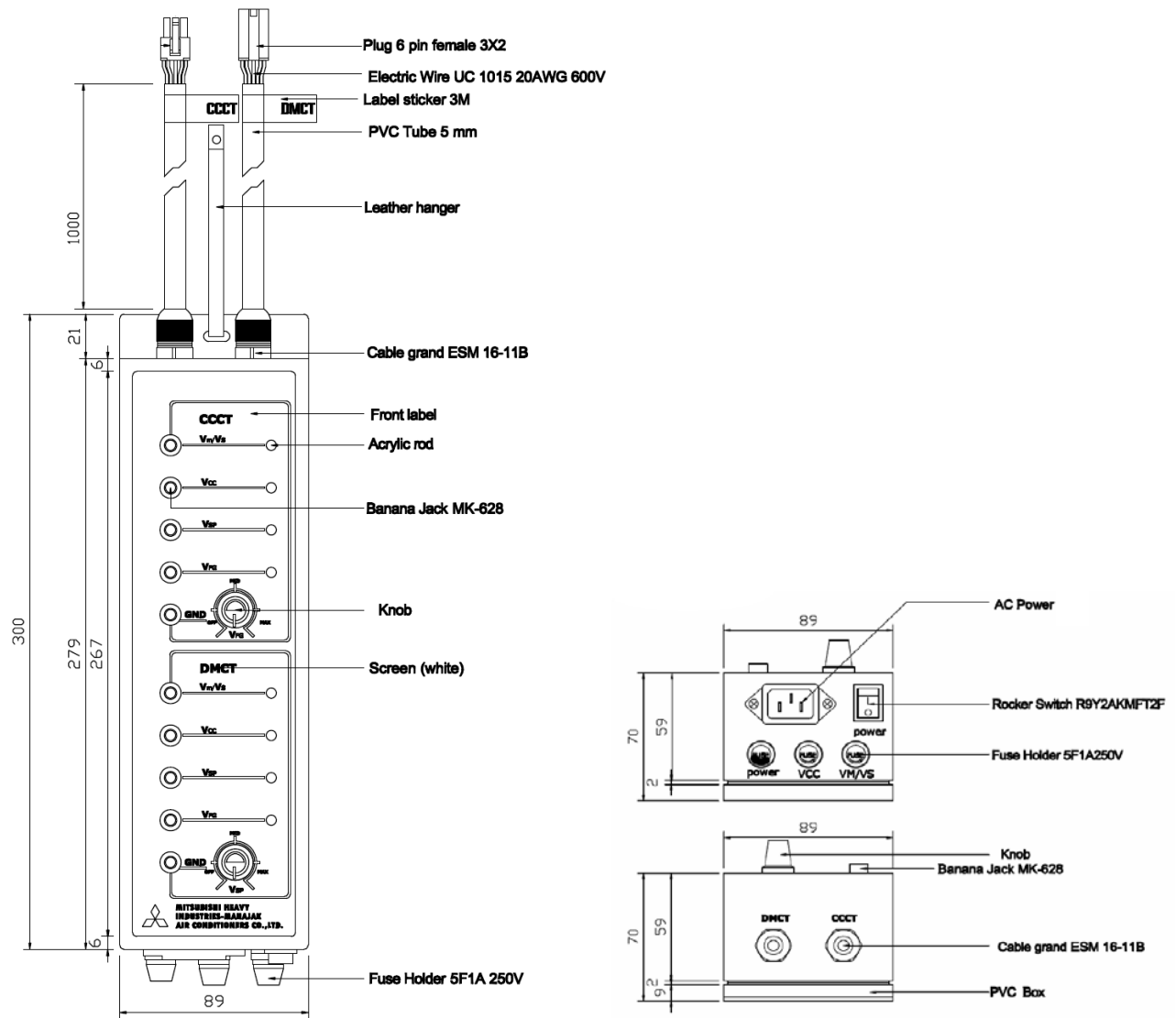
Name: RAC Service Tool Kit

- 1.0.0** TOOL CASE
- 2.0.0** DMCT- CCCT CHECKER TOOL
 - 2.1.1** TRANSFER BOX-TYPE A (DMCT)
 - 2.1.2** CABLE FOR DC MOTOR TYPE B (DMCT)
 - 2.1.3** TRANSFER BOX-TYPE C (DMCT)
 - 2.1.4** TRANSFER BOX-TYPE D (DMCT)
 - 2.2.1** CABLE FOR TYPE A (CCCT)
 - 2.2.2** CABLE FOR TYPE B (CCCT)
 - 2.2.3** CABLE FOR TYPE C (CCCT)
 - 2.2.4** CABLE FOR TYPE D (CCCT)
- 3.0.0** INVERTER CHECKER (ICT)
- 4.0.0** COMMUNICATION TOOL (COMT)

1. TOOL CASE (RMA006A000)



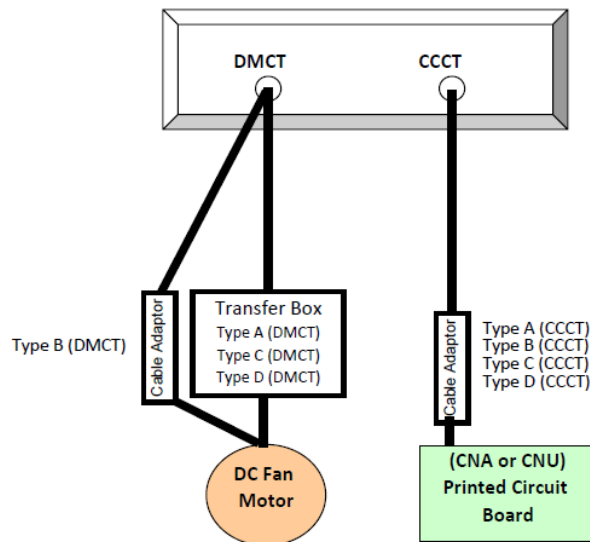
2. DMCT- CCCT CHECKER TOOL (RMA006A002)



■ FUNCTION & USAGE

The checker tool is used to test DC fan motor operation (DMCT) & PCB output (CCCT) to DC fan motor.

Checker Tool Configuration



CCCT

- The indoor unit PCB supplies voltage output to vary the speed of the DC motor, these outputs are displayed on the checker tool by rotating the variable switch
- When testing the voltage output from the PCB, there is no need to supply power to the checker tool, the air-conditioner power supply is used to display reading from the checker tool.
- The LED display will confirm the various outputs to the DC fan motor and the response input from the DC fan motor.

DMCT

- The checker tool with AC power applied can drive the DC fan motor directly without use of the PCB.
- The speed of the fan motor can be controlled by rotating the variable switch.
- The LED display will confirm the input and output signals of the DC motor to be correct.

Note: The motor should be tested with a multi meter prior to connection to avoid blowing the fuse on the checker tool.

TRANSFER BOX & CABLE FOR DMCT

The transfer boxes (*Lead only for type B*) are used to connect the various types of DC fan motor plugs to the checker tool connector DMCT. You will need to check the compatibility table to determine the interface for each DC Motor, please do this carefully.

CONNECTION CABLE FOR CCCT

The CCCT connection cables are used to connect the various types of PCB connections to the checker tool connector CCCT and confirm the output from the PCB is OK.

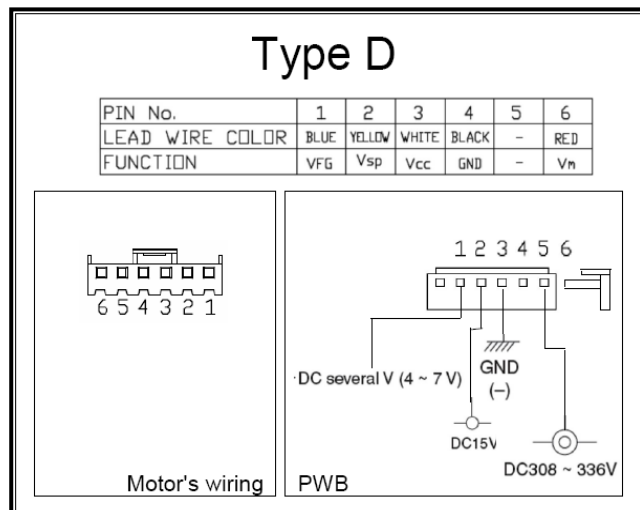
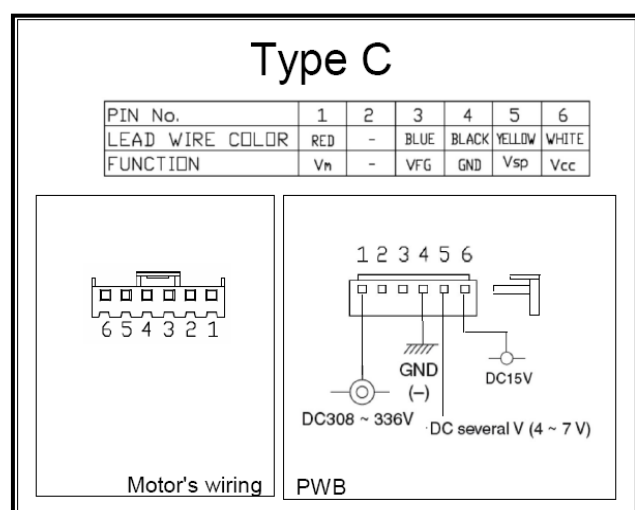
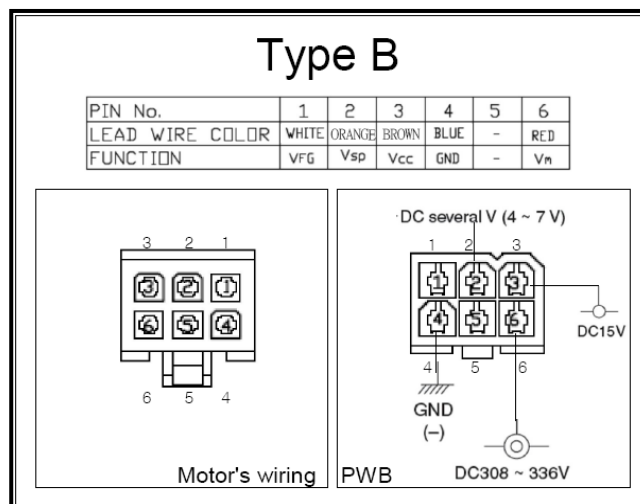
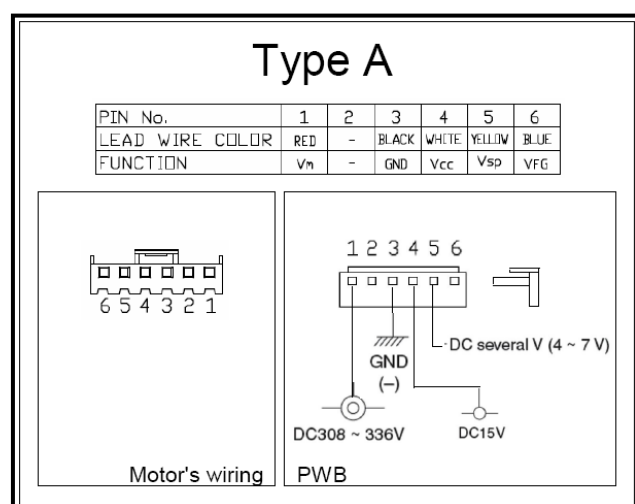
Check Procedure for DC Motor check (DMCT)

1. Check the DC motor rotation by hand – OK?
2. Check the Model No and Part No in the following tables – Select the Type A, B, C or D
3. Check the resistance of the DC motor as per page 8 – OK?
4. If resistance is OK connect the DC motor using the correct type of transfer box or cable
5. Apply power to the checker tool – set the speed controller to the minimum setting
6. Check Voltage - Vm to Gnd= 330VDC Vcc to Gnd= 15VDC approx. If no DC voltage is found, check if the fuses on the checker tool are OK? When the speed controller is turned clockwise, observe if Vsp (Orange LED) and Vfg (Blue LED) are flashing on and off? If so the motor will now turn if normal.
7. Observe that the DC motor operates correctly – OK?
8. If no operation turn off power and check fuse - OK?
9. Conclude if DC motor is OK?
10. Disconnect the motor from the checker tool

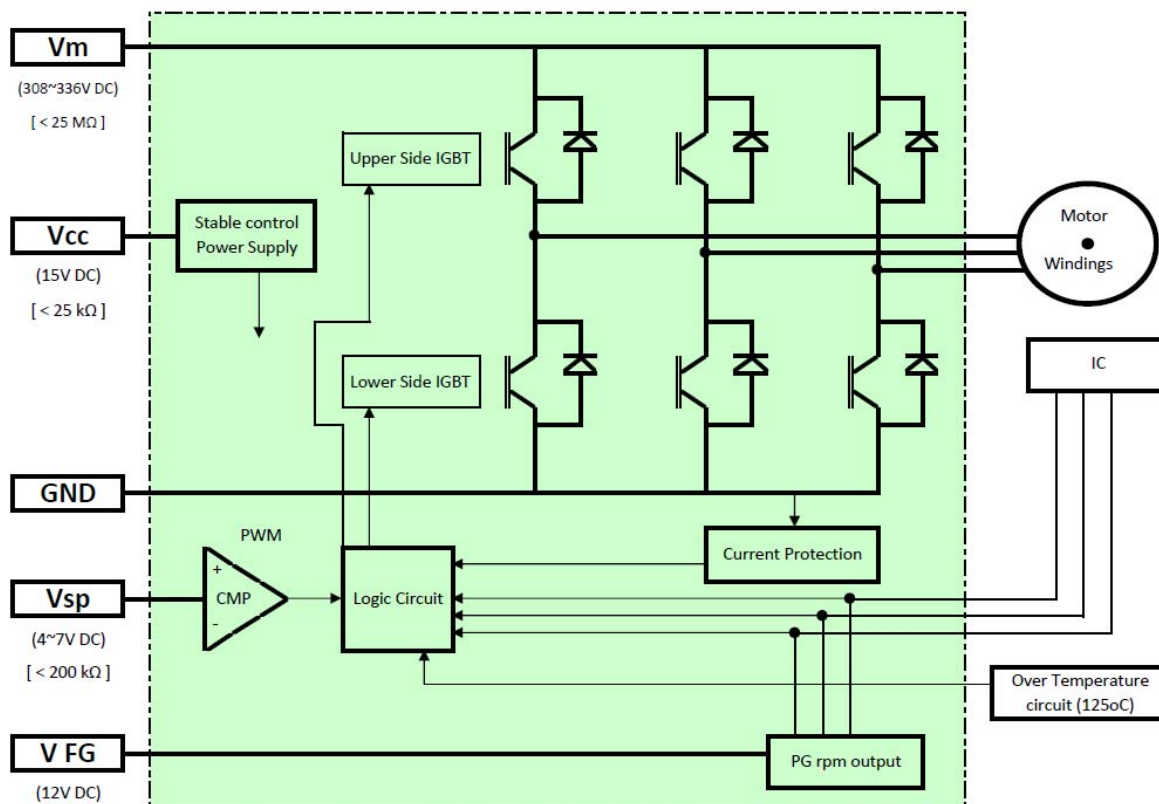
Check Procedure for PCB (CCCT)

1. Turn the power off to the air conditioner and checker (Checker is power by PCB)
2. Check the appearance of the PCB – fuse, varistor and other components are not damaged – OK?
3. Select the PWB transfer cable from the model table – Type A, B, C or D
4. Connect the transfer cable between the PCB and checker tool, set the speed controller to minimum setting
5. Turn power on to the air conditioner and send a command from the remote controller to start the outdoor fan motor
6. Check Voltage - Vm to Gnd= 330VDC. Vcc to Gnd= 15VDC approx. If no DC voltage is found, check if the fuses on the checker tool are OK? If PWB output is OK increase the speed controller, Vsp (Orange LED) & Vfg (Blue LED) will flash on and off, indicating PWB pulse input Vsp (Orange LED) to CCCT has been received and a signal has been sent back to PWB by CCCT pulse output - Vfg (Blue LED). Note: Dependant on remote control settings Vsp (Orange LED) may light up solid or go out, as compressor may be at max Hz and PWB output Vsp (Orange LED) to CCCT is now at high speed. VFG (Blue LED) will only flash on & off at any stage of this test when the speed controller is turned in the clockwise direction.
7. Conclude if PCB is OK?

DC fan motor connector		GND	V _m	V _{cc}	V _{sp}	V FG
		Ground	Motor Voltage Input	Control Power Voltage Input	Speed Control Voltage Input	Revolution Pulse Output
TYPE A	Wire Colour	Black	Red	White	Yellow	Blue
	PIN No	3	1	4	5	6
TYPE B	Wire Colour	Blue	Red	Brown	Orange	White
	PIN No	4	6	3	2	1
TYPE C	Wire Colour	Black	Red	White	Yellow	Blue
	PIN No	4	1	6	5	3
TYPE D	Wire Colour	Black	Red	White	Yellow	Blue
	PIN No	4	6	3	2	1



Typical Internal DC Motor circuit



Multi Meter Resistance Check	GND (Black Probe)
Vsp (Red Probe)	200 kΩ or higher
Vcc (Red Probe)	25 kΩ or higher
Vm (Red Probe)	1 MΩ or higher

DC MOTOR NOTES

- Never disconnect or reconnect a DC motor while the power is on to the air conditioner.
- Never disconnect or reconnect a DC motor while the fan shaft is turning.
- Always rotate the shaft of a DC motor by hand to ensure it rotates smoothly, if tight DC motor is usually faulty.

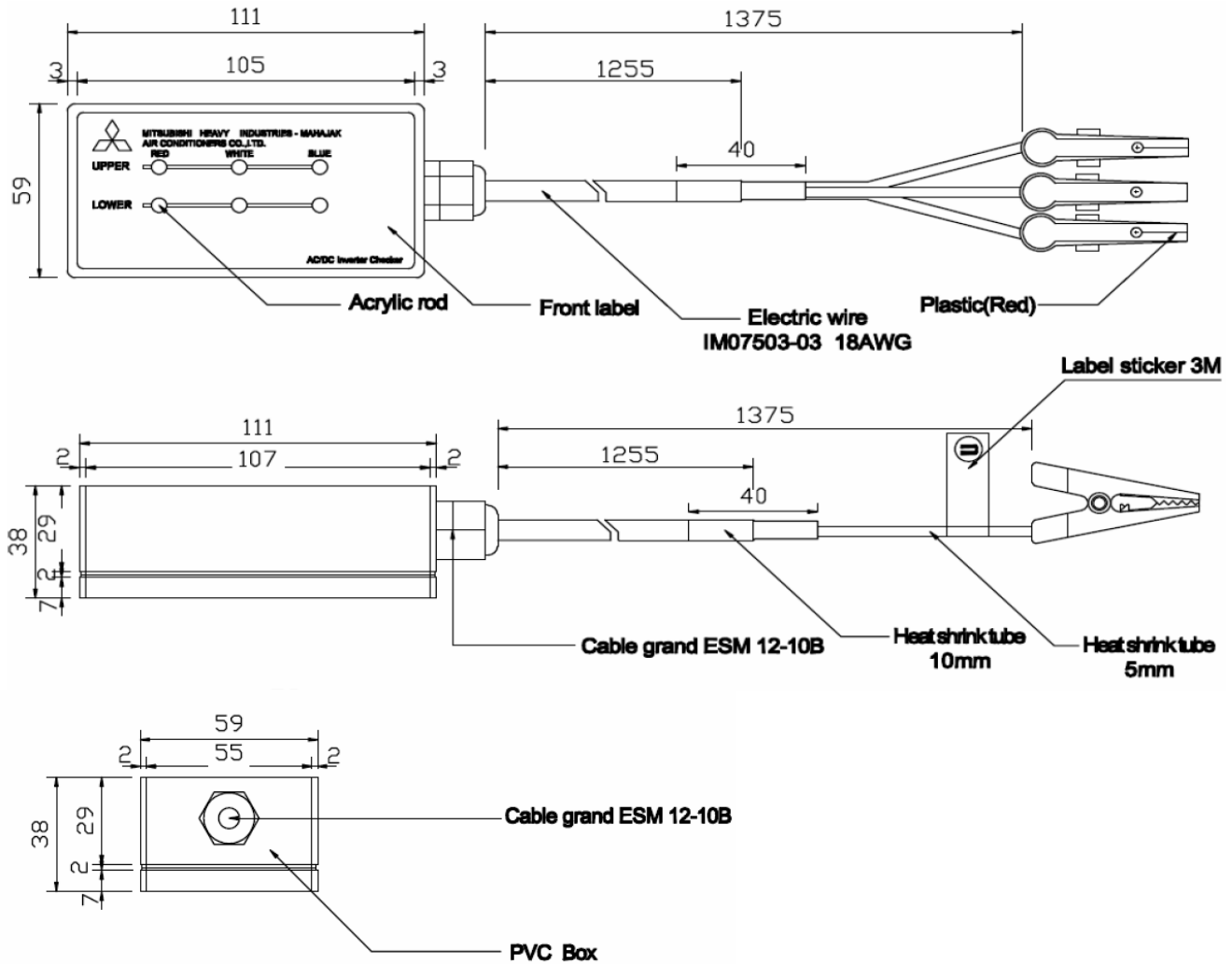
Please view the following tables to select the Model No and Connector Type for testing DC motors & PCB.

Indoor DC fan motor (CNU)

Model	Part No.	Type of connector	RPM (@ Vsp 6.5V)	Vm	Vcc	Vsp	V FG
SRK20ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK20ZJ-S	SSA512T081B	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK20ZIX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK20ZJX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK25ZD-S	SSA512T064B	A	2079	240 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK25ZGA-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK25ZJ-S	SSA512T081B	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK25ZDXA-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK25ZGX-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK25ZIX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK25ZJX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK35ZDA-S	SSA512T064B	A	2079	240 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK35ZGA-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK35ZJ-S	SSA512T081B	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK35ZDXA-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK35ZGX-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK35ZIX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK35ZJX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK56HEA-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK50ZDA-S	SSA512T064B	A	2079	240 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK50ZJ-S	SSA512T081B	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SRK50ZFX-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK50ZGX-S	SSA512T046F	A	2340	50~370	13.5~16.5	0~6.5	12
SRK50ZHX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK50ZIX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK50ZJX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK60ZHX-S	SSA512T093	A	2010	90 ~ 185	13.5~16.5	0 ~ 6.5	12
SRK60ZIX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK60ZJX-S	SSA512T092	A	2307	200 ~ 410	13.5~16.5	0 ~ 7.3	12
SRK63ZEA-S	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK63ZEA-S1	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK71ZEA-S	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK71ZEA-S1	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK80ZEA-S	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK80ZEA-S1	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRK80ZEA-S2	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRF50ZIX-S	SSA512T072B	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRF35ZIX-S	SSA512T072B	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRF25ZIX-S	SSA512T072B	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRF50ZJX-S	SSA512T072C	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRF35ZJX-S	SSA512T072C	A	1781	51 ~ 370	13.5~16.6	1 ~ 6.5	13
SRF25ZJX-S	SSA512T072C	A	1782	52 ~ 370	13.5~16.7	2 ~ 6.5	14
SKM20ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM22ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM25ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM28ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM35ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM50ZF-S	SSA512T064B	A	2079	240 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM50ZG-S	SSA512T081	A	2479	200 ~ 375	13.5~16.5	0 ~ 7.3	12
SKM60ZG-S	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SKM71ZG-S	SSA512T072A	A	1780	50 ~ 370	13.5~16.5	0 ~ 6.5	12

Outdoor DC fan motor (CNA)							
Model	Part No.	Type of connector	RPM (@ Vsp 6.5V)	Vm	Vcc	Vsp	V FG
SRC20ZG-S	SSA512T075	D	1867~2284	120 ~ 375	14 ~ 16	0 ~ 7.3	12
SRC20ZJ-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC20ZIX-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC20ZJX-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC25ZDA-S	SSA512T038D	D	1917~2343	120~375	14~16	0~7.3	12
SRC25ZG-S	SSA512T075	D	1867~2284	120 ~ 375	14 ~ 16	0 ~ 7.3	12
SRC25ZJ-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC25ZDXA-S	SSA512T038D	D	1917~2343	120~375	14 ~ 16	0~7.3	12
SRC25ZGX-S	SSA512T075	D	1867~2284	120 ~ 375	14 ~ 16	0 ~ 7.3	12
SRC25ZIX-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC25ZJX-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC35ZDA-S	SSA512T038D	D	1917~2344	120~375	14~16	0~7.3	12
SRC35ZG-S	SSA512T075	D	1867~2284	120 ~ 375	14 ~ 16	0 ~ 7.3	12
SRC35ZJ-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC35ZDXA-S	SSA512T038D	D	1917~2343	120~375	14~16	0 ~ 7.3	12
SRC35ZGX-S	SSA512T076	B	1900	50 ~ 400	13.5~16.5	0 ~ 6.5	12
SRC35ZIX-S	SSA512T094	D	1690	50 ~ 370	13.5~16.5	0 ~ 6.5	12
SRC35ZJX-S	SSA512T094	D	1690	50 ~ 370	13.5 ~ 16.5	0 ~ 6.5	12
SRC40ZHX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC40ZIX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC50ZFX-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SRC50ZGX-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SRC50ZHX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC50ZIX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC60ZHX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC60ZIX-S	SSA512T091A	D	1342~1641	70 ~ 410	14 ~ 16	0 ~ 7.3	12
SRC63ZE-S	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC63ZE-S1	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC71ZE-S	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC71ZE-S1	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC80ZE-S	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC80ZE-S1	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SRC80ZE-S2	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SCM40ZF-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM40ZG-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM40ZJ-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM45ZF-S	SSA512T061A	B	1690	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM45ZG-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM48ZF-S	SSA512T061A	B	1690	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM48ZG-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM50ZJ-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM60ZF-S	SSA512T061A	B	1690	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM60ZG-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM60ZJ-S	SSA512T061B	B	1850	200 ~ 410	13.5~16.5	0 ~ 6.5	12
SCM80ZF-S	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SCM80ZG-S	SSA512T076C	B	1950	50 ~ 450	13.5~16.5	0~6.5	12
SCM80ZJ-S	SSA512T076D	B	1900	50 ~ 450	13.5~16.5	0~6.5	12

3. INVERTER CHECKER TOOL (RMA006A003)

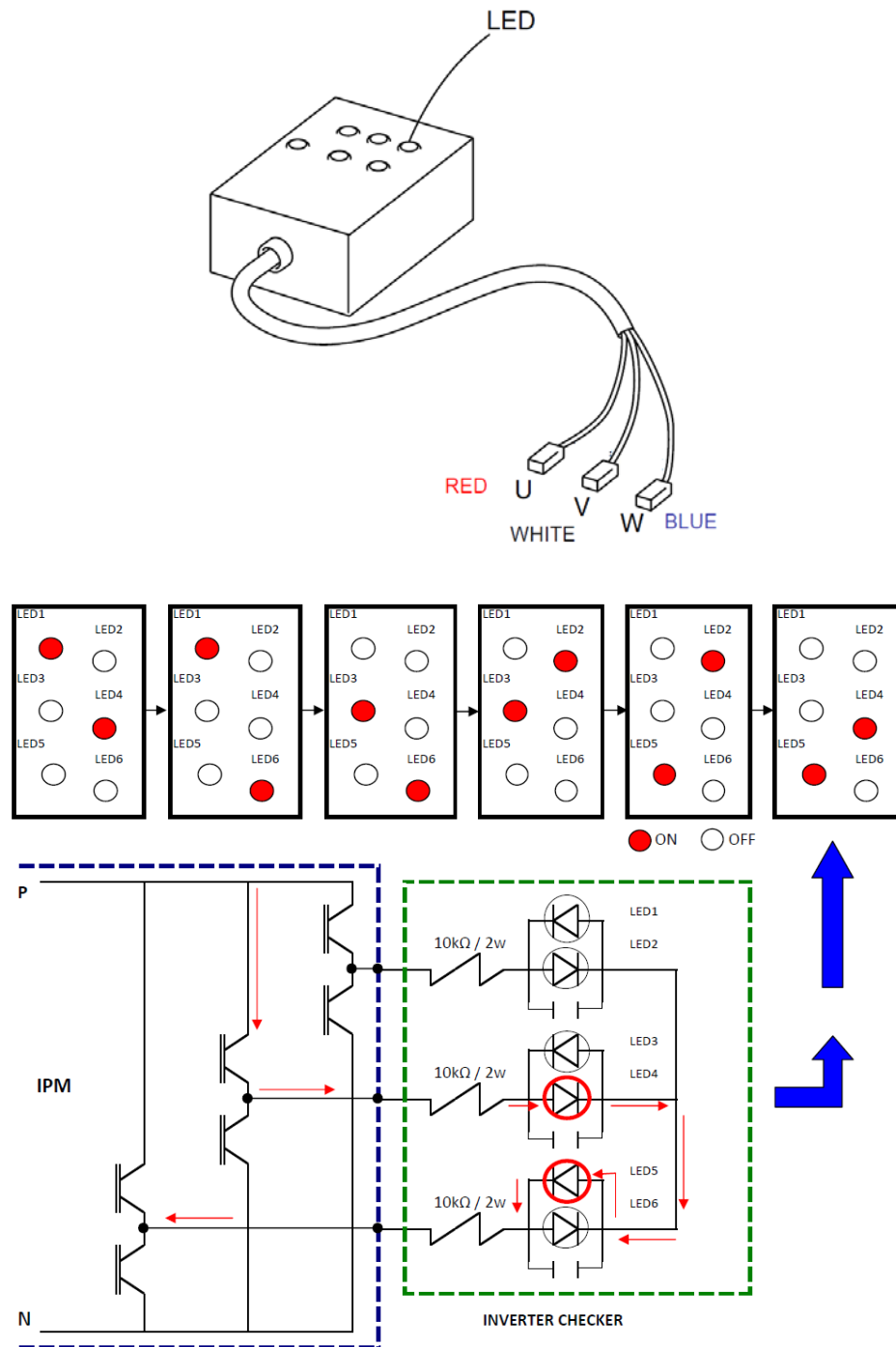


▪ FUNCTION & USAGE

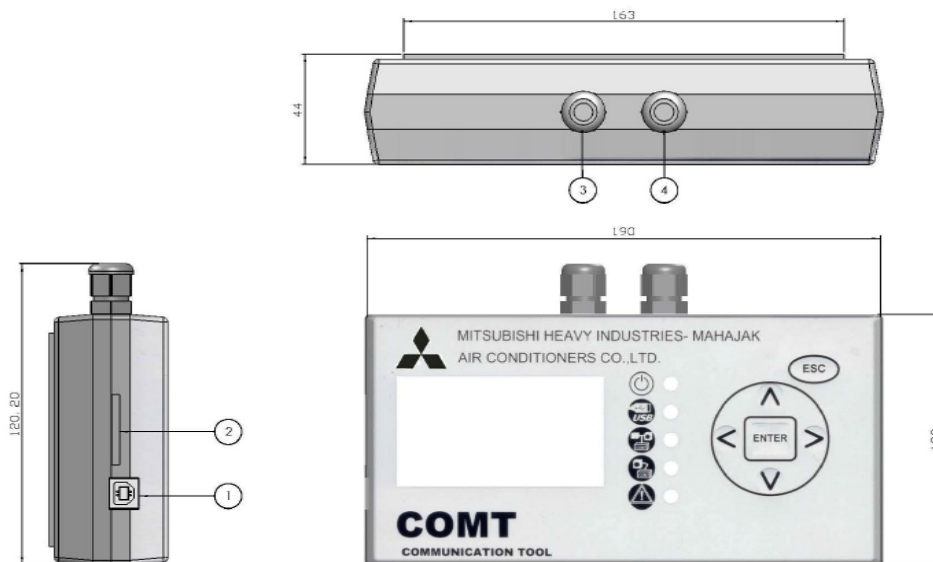
The inverter checker tool is used to verify the correct voltage is supplied to the compressor

Connection procedure of the inverter checker

1. Turn the power supply off. (Breaker or Isolator OFF)
2. Disconnect the wiring of compressor from the PCB
3. Connect the wiring of the inverter checker (U = red, V = white, W = blue) to the terminals of the PCB
4. Turn the power supply on.
5. Set the unit to cooling 18oC to initiate a compressor on command
6. All LED's (1~6) should flash to confirm correct output from PCB to compressor
7. Depending on the control logic after a period of time the unit will activate and stop on under-current



4. COMT – RMA006A014 COMMUNICATION TOOL



- 2 Serial Data Connector
- 3 USB Connector to PC
- 4 SD Card
- 5 RAM Data connector

▪ FUNCTION & USAGE

The communication tool is used to view operational and communication data from the system

The data saved to the SD card and software will soon be developed to read these files in csv and graphical format on a PC

Connection procedure of the inverter checker

- (1) Select connector type of COMT from A/C model.
- (2) Turn off unit and breaker before connecting COMT every time.
- (3) Connect cable of COMT to A/C unit.
 - Serial connection; just only uses Serial connection cable.
 - RAM connection; have to open Panel front assy of outdoor unit when connect RAMPlease connect both of RAM and serial connection cable.
- (4) Turn on breaker and A/C unit.
- (5) See display of COMT.

(6) Main menu page.

- Input file name to record.
- Select sampling time; 10 or 60 sec.
- Select type of connector; Serial, Multi, RAM, EEPROM

MAIN MENU	1. FILE NAME	FILE NAME
		EDIT FILE NAME
	2. SAMPLING TIME	60 SEC
		10 SEC
	3. GO TO LOG MODE	GET SERIAL SINGLE
		GET SERIAL MULTI
		GET RAM DATA
		GET EEPROM DATA
	4. INFO&SETTING	PROC&STRUCTURE
		DIAGNOSIS ERROR LED
		DATE/ TIME SET

(7) When select go to log mode and type connector of ROM finish.

Display will show communication data between indoor and outdoor unit.

Please see running communication data to check.

3. GO TO LOG MODE	GET SERIAL, RAM, EEPROM DATA DEPENDING ON MODEL TYPE AND CONNECTION	DISPLAY ONLY =>START SD+DISPLAY => START	1 - RUN MODE COOL
			2 - 4WAY VALVE
			3 - SOLENOID VALVE
			4 - INV FREQ CMD
			5 - INV FREQ ACT
			6 - EEV CMD
			7 - CUR SAFE MODE
			8 - CURRENT SAFE STAT
			9 - OD FAN MODE
			A - OD PER STOP
			B - OD CUR
			C - OD AIR TEMP
			D - OD HEAT TEMP
			E - DISCH TEMP
			F - DC-V

(8) Service man has to analysis data and compare with normal condition.

(9) If outdoor unit has problem or error. Display of COMT will show alarm and explain on the last page.

4. INFO&SETTING	PROC & STRUCTURE	1. POWER ON
		2. CONNECT CABLE
		3. INPUT FILE NAME
		4. SET SAMPLING TIME
		5. GO TO LOG MODE
		6. GET DATA (SERIAL, RAM)
	DIAGNOSIS ERROR LED	LIST OF ERROR CODES
		DESCRIPTION ESTIMATED CAUSES
	DATE/ TIME SET	SET DATE & TIME



Please insert SD card in this port
To USB. PC./notebook



Fig. 1 Outline of COMT and SD card

1. Connection cable of COMT (connect to outdoor unit)



Fig 2 Connection cables of COMT

1.1 Serial → for SRK**ZG, SRK**ZE model. (Connect Serial only)

1.2 RAM → for SRK**ZHX, SRK**ZIX, SRK**ZJ, SRK**ZJX models (Connect Serial & RAM)

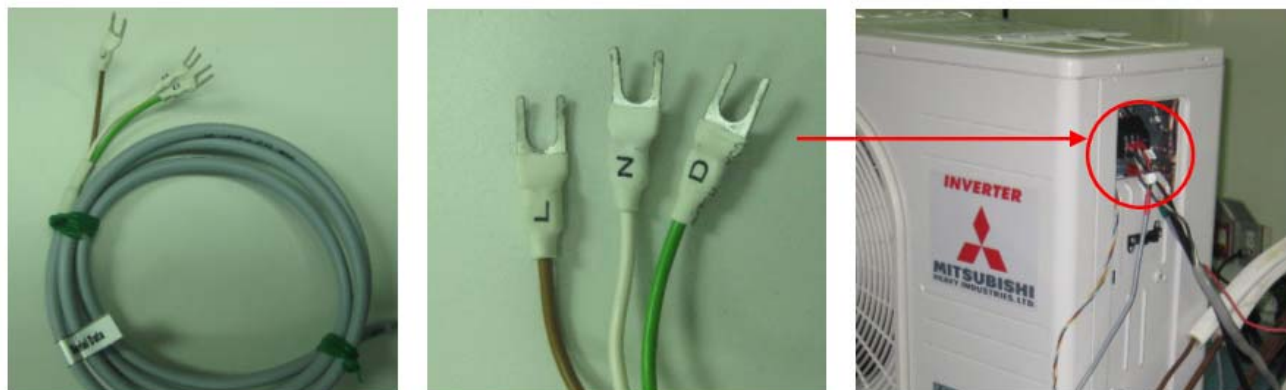


Fig. 3 Serial connection procedure

L → LINE (1), N → N (2), D → Signal (3)

.2 RAM → for ZHX, ZIX and ZJ model.

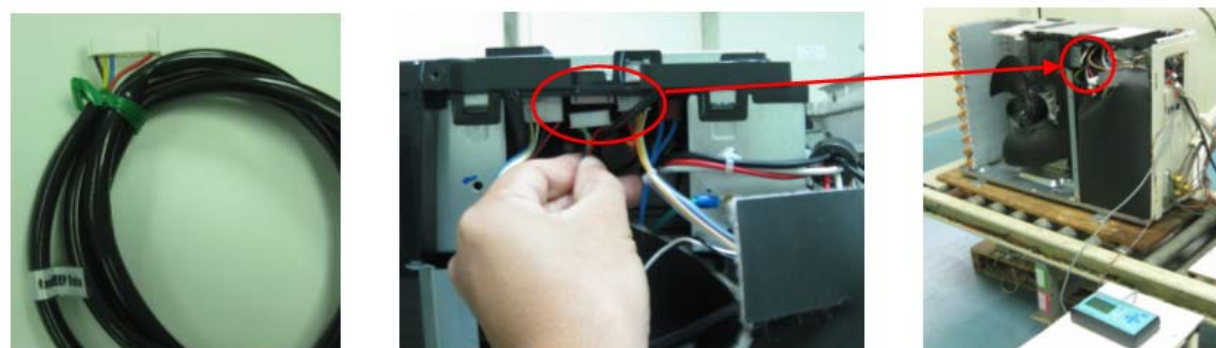


Fig. 4 RAM connection procedure

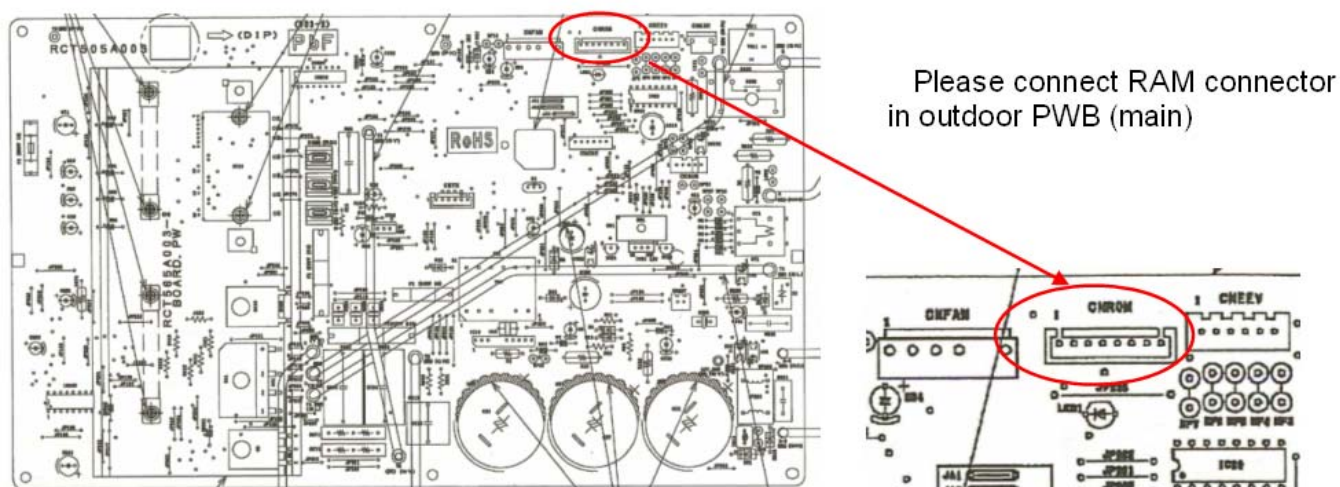


Fig. 5 Position of RAM connector in outdoor PWB (main)